

NOTES ON ORIENTAL BIBIONIDAE, WITH DESCRIPTIONS OF NEW SPECIES.

By E. BRUNETTI.

In the following notes are offered revised and augmented tables of species in *Bibio* and *Plecia*, descriptions of several new species and some notes of interest on others. My genus *Parapleciomyia* may be of sub-generic rank only and it is herein so regarded. My thanks are due and tendered to Mr. Edwards of the British Museum, for the information that three species of *Bibio*, considered by me to be synonymous, are really distinct, also of a similar instance regarding three species of *Plecia*.

Scatopse pulchripes, sp. nov.

♂. Sikkim.

Long. $1\frac{1}{2}$ mm.

Head black; antennae black, shortly pubescent, two basal joints of flagellum bright orange, last joint bluntly conical, twice as long as penultimate and with a trace of constriction about the middle. Eyes with reddish brown facets; the ocelli conspicuous, whitish, very large and well separated.

Thorax and *abdomen* dull black.

Legs black, basal half of tibiae shining white, tips of tibiae brownish yellow; tarsi yellowish.

Wings grey, costa at extreme base yellow. Venation normal, 1st and 3rd veins black, distinct, former ending at one-third, the latter distinctly beyond the middle of the wing: remaining veins fainter but obvious: 4th longitudinal forking at half its length; the 2nd posterior cell long and narrow, slightly contracted about the middle, the veins thence gradually diverging; 5th vein straight for the greater part of its length; 6th bent down suddenly shortly beyond the base, almost immediately afterwards turning outward again. Halteres obscure.

Described from a unique ♂ in good condition in the Indian Museum from Shamdang, Sikkim, 3,000 ft., 7-ix-09.

Mr. Edwards has pointed out to me the affinity of this species with the European *S. nigripennis* Mg. (*annulipes* v. Ros.).

Crapitula melanaspis Wied.

Specimens shewing the following data have recently come before me. Dalat, Langbian Prov., South Annam, 5,000 ft., iv-v-1918 (*Boden Kloss*); Umang-Lai, Wang Jing Village, Manipur, Assam, 2,600 ft.; Thanga Is., Logtak Lake, Manipur, Feb., 1920 (*Manipur Survey*).

Crapitula simplicipes, sp. nov.

♂ ♀. Very near *melanaspis* W., but structurally distinct in two characters; 1st, the hind tibiae are not at all dilated apically, nor are the hind metatarsi in the least degree incrassated, and 2nd, the scapal joints of the antennae are longer and the last two (9th and 10th) flagellar

joints are annealed into a single joint. A third character which is at once obvious is the entirely reddish orange thoracic dorsum. In all else as in *melanaspis*.

Three of each sex from the Darjiling District, Darjiling, Ghoom and Lebong, 11-13-vi-14 (*Gravelly*).

Type ♂, Lebong, 6,000-6,600 ft., 13-vi-14; *type* ♀, near Ghoom, 6,000-7,000 ft., 11-vi-14, both in the Indian Museum.

Plecia Wied.

The presence of two new species, *aterrima* and *sordida*, necessitated a closer examination of known species, and revealed the fact (which I believe has not hitherto been noted) that the number of antennal joints is not always the same in both sexes.

From actual observation of specimens before me *indica* has 12 joints ♂ ♀; *atra* ♀, 12 joints, the ♂ being unknown; *obscura* ♂ ♀, 10 joints; *carbonaria* ♂, 11 joints, ♀ 12 joints; *thoracica*¹ ♂, 10 joints, ♀ 11 joints; *impostor* ♂ ♀, 9 joints; *tergorata* ♂ ♀, 10 joints; *aterrima* ♂, 10 joints, ♀ 12 joints; *sordida* ♂ ♀, 9 joints.

Of *forcipata* Ost. Sack. ♂ and *tristis* Wulp ♀, the authors do not state the number of joints and neither species has come before me.

Table of Oriental species of Plecia.

1. 3rd vein forking soon after anterior cross vein; approximately opposite fork of 4th vein; upper branch more or less parallel with lower one (<i>melanaspis</i> -like). (<i>Parapleciomyia</i> , Brun.) ² ..	2
3rd vein forking some distance after anterior cross vein, distinctly beyond fork of 4th vein; upper branch at an angle of from 45° to nearly perpendicular (<i>fulvicollis</i> -like). (<i>Plecia</i>). ² ..	5
2. Thoracic dorsum orange ³ , (antennae 12-jointed). Long. 6—9 mm.	<i>indica</i> Brun. ♂ ♀.
Wholly black species	3
3. Long. 8—12 mm.; (antennae 12-jointed) ..	<i>atra</i> Brun. ♀.
Long. 6—7 mm.	4
4. Antennae 10-jointed. Long. 6—7 mm. ..	<i>obscura</i> Brun. ♂ ♀.
Antennae ♂ 11-jointed, ♀ 12-jointed. Long. 6 mm. ..	<i>carbonaria</i> Brun. ♂ ♀.
5. Thorax with at least dorsum wholly orange (except in <i>impostor</i> , in which only the hinder half is of this colour)	6
Thorax all black	9
6. (a) Entire thorax orange, including pleurae, scutellum and metanotum: (antennae ♂ 10, ♀ 11-jointed) ..	7
(b) Only hinder half of thoracic dorsum orange, the whole thorax otherwise entirely black. (Antennae 9-jointed)	<i>impostor</i> Brun. ♂ ♀.
(c) Thoracic dorsum wholly orange, remainder black	8

¹ According to Mr. Edwards, the common Oriental species of the plains generally known as *fulvicollis* F. is really *thoracica* Guer.

² The exact angle of the upper branch of the 3rd vein is not constant, nor is its exact position in relation to the fork of the 4th vein.

³ The term orange is used in this table as being the most generally applicable, including the reds and yellows of the older authors. It is only employed here in contrast to blacks and browns, therefore confusion is impossible.

7. Ocelli and ocellar triangle in ♂ very large ; antennae in ♂ 9, in ♀ 11-jointed *fulvicollis* F. ¹
 Ocelli and ocellar triangle in ♂ very small ; antennae in ♂ 10, in ♀ 11-jointed *thoracica* Guer.
8. A broad " red " (?orange) stripe reaching from base of one halter to the other, passing forwards over the pleurae *forcipata* Ost. Sack. ♂.
 No such stripe, (antennae 10-jointed). *tergorata* Rond. ♂ ♀.
9. Thorax light grey, with 3 longitudinal shining black stripes, united at their centres *tristis* Wulp ♀.
 Thorax black or blackish, unstriped 10
10. Velvet black species ; antennae ♂ 10, ♀ 12-jointed .. *aterrima*, sp. nov. ♂ ♀.
 Dirty black species ; antennae ♂ ♀ 9-jointed .. *sordida*, sp. nov. ♂ ♀.

***Plecia indica* Brun.**

Further specimens are in the Indian Museum from Almora, Kumaon District, 5,000 ft., 27-ix—4-x-11, four females (*Paiva*) and one from the same locality and collector 1—18-iii-12 ; another from Sureil, 11—31-x-17 (*Annandale* and *Gravelly*).

***Plecia atra* Brun.**

Sureil, 5,000 ft., iv-v-17 (*Kemp*), two ♀♀.

***Plecia (Parapleciomyia) carbonaria* Brun.**

A better characterisation of this species would have been the position of the forking of the 3rd vein, as adopted in the table of species herein offered. In the unique type ♂ and ♀ the antennae of the former contain only 11 joints, those of the latter 12 joints. Both specimens are from the same district and captured within a few days of each other. The ♂ flagellum is apparently of 9 joints, of which the two basal ones give the impression of being a single longer joint almost constricted in the middle, the basal half being bare, though the whole of the remainder of the flagellum is very distinctly pubescent. In the ♀ the basal flagellar joint is very obviously of the nature described, the constriction just before the middle more distinct, the joint less than twice as long as the next joint, the basal half bare, the rest of the flagellum pubescent. Counting this way there are 9 very distinct joints and a very distinct small apical joint, making a 12-jointed antenna altogether.

***Plecia impostor* Brun.**

This species may have been overlooked in collections on account of its extraordinary resemblance to *Crapitula melanaspis* W., as these two species are the only two in which only the hinder half of the thoracic dorsum is orange. It is certainly much inferior in size, but some of the smallest specimens of *melanaspis* seen by me are very little larger than *impostor*. The number of antennal joints is an infallible test, as in Wiede-

¹ Mr. Edwards informs me that *subvarians* Walk. is distinct from *fulvicollis* F. As I have not seen a male I am unable to include it in the table.

mann's species there are 12 whilst *impostor* possesses only 9, the ultimate one minute but distinct.

Plecia forcipata Ost. Sack.

Though this has never come before me, de Meijere records it twice recently from Java. It should be easily recognised from all others by the uninterrupted reddish stripe passing from the base of one halter to the other by extending forwards across the pleurae, descending below the front coxae. The species must be quite a sound one as it was described from 11 specimens (from Sumatra), all ♂♂.

Osten Sacken does not mention the number of antennal joints.

Plecia tergorata Rond.

Kalan, S. Shan States, 4—5,000 ft., 10-iii-17 (*Gravelly*); Khasi Hills, viii; Rangamati, Chittagong Hill Tracts, 11—16-xi-15 (*Hodgart*); Sukna, vii; Darjiling District, vii, viii; Kurseong, vi; Talewadi, near Castle Rock, North Kanara District, 3—10-x-16, common (*Kemp*); Thanga Is., Logtak Lake, Manipur, Feb. 1920 (*Manipur Survey*); Potosengbam, Manipur, Feb. 1920 (*Manipur Survey*).

This species occasionally attains very small proportions, de Meijere recording a ♂ from Batavia only 4 mm. in wing length. The smallest in the Indian Museum is a ♂ barely 3 mm. long, taken *in cop.* with a ♀ hardly appreciably larger.

Plecia tristis Wulp.

Van der Wulp described this from a unique ♀ from East Java, and de Meijere refers to this species a ♂ from Java. Wulp noted that the venation was similar to that of *fulvicollis*, and at that time no forms were known of the group that constituted my *Parapleciomyia*. The species should be distinct from all others by the light grey thorax with longitudinal black stripes. Neither Wulp nor de Meijere note the number of antennal joints.

Plecia aterrima, sp. nov.

♂♀. Darjiling District.

Long. 8-9 mm.

Very like *atra* in appearance and size, but differing radically in the forking of the 3rd vein, being a true *Plecia*. Wholly black; antennae in ♂ 10-jointed, in ♀ 12-jointed. In the ♂ the 1st flagellar joint is very distinctly larger than the 2nd and there is no sign of constriction or any impressed line; the apical (8th) flagellar joint is elongate, distinctly longer than the other sub-apical joints, and is rounded at the tip. In the ♀ the flagellum consists of ten very distinct joints, the basal and apical ones similar to those in the ♂.

Described from a single ♂ and ♀ from Kalimpong, 600—4,500 ft., 24-iv—10-v-15 (*Gravelly*). I have since seen it from Langbian Peaks, South Annam, 6,000—7,500 ft., iv-1918 (*Boden Kloss*), several specimens; and from Dalat, South Annam, iv-v-1918 (*Boden Kloss*).

***Plecia sordida*, sp. nov.**

♂ ♀. Darjiling District.

Long. 4 mm.

A dirty black small species with a little greyish dust on thoracic dorsum ; pubescence of dorsum very sparse, that of abdomen and legs more obvious, brownish grey. Legs distinctly though slightly clubbed towards tips. Antennae 9-jointed in both sexes. Wings brownish, venation that of normal *Plecia*.

2 ♂♂, 1 ♀ in Indian Museum, Darjiling, 7,000 ft., 7-vi-17 (*Brunetti*).

Table of Oriental species of Bibio.

1. Thorax wholly yellowish (reddish or orange) ; or at least dorsum completely so	..	..	2
Thorax wholly black or blackish	..	..	8
2. Abdomen yellowish	..	..	3
Abdomen black	..	..	6
3. Entire thorax reddish yellow or orange	..	..	4
Pleurae black ; thoracic dorsum orange	..	..	<i>hortulanoides</i> Brun.
4. Wings wholly and conspicuously yellow	..	..	5
Wings grey brown, distinctly dark brown anteriorly, in no part at all yellowish ; (inner spine of fore tibia about half as long as outer one)	..	..	<i>obediens</i> Ost. Sack.
5. 2nd scapal and 1st palpal joint black ; fore tibial spines subequal ; all femora black-tipped	..	..	<i>rubicundus</i> Wulp.
2nd scapal and 1st palpal joint yellow or orange ; all femora orange to tips ; inner claw of fore femora about half as long as outer one	..	..	<i>flavissimus</i> , sp. nov.
6. Legs yellowish	..	..	<i>discalis</i> Brun.
Legs black	..	..	7
7. Pleurae black ; thoracic dorsum reddish yellow	..	..	<i>bicolor</i> Walk.
Whole thorax reddish yellow	..	..	<i>plecioides</i> Ost. Sack.
8. Abdomen practically wholly orange	..	..	<i>abdominalis</i> Brun. ♀.
Abdomen all black	..	..	9
9. Femora wholly yellowish	..	..	10
Femora wholly black or dark brown	..	..	13
10. Fore femora with a conspicuous fringe of black pubescence at about the middle	..	..	<i>collaripes</i> , sp. nov. ♂.
Fore femora without such fringe	..	..	11
11. Tibiae and tarsi black	..	..	<i>rufifemur</i> Brun.
Tibiae and tarsi reddish yellow	..	..	12
12. (a) Wings nearly clear, veins and stigma very distinct	..	..	<i>johannis</i> L.
(b) Wings distinctly blackish, veins distinct	..	..	<i>nigripennis</i> Brun.
(c) Wings distinctly yellowish, anteriorly and stigma darker yellow	..	..	<i>collaripes</i> , sp. nov. ♀
13. Large species, 11—15 mm.	..	..	<i>obscuripennis</i> De Meij.
Smaller species, at most 8 mm.	..	..	14
14. Body pubescence nearly or wholly black or dark brown	..	..	15
Body pubescence yellowish or grey	..	..	17
15. (a) Tibiae distinctly brownish yellow (femora shining black)	..	..	<i>fuscitibia</i> Brun.
(b) Tibiae moderately dark brown (femora darker)	<i>defectus</i> Brun.
(c) Tibiae (and femora) wholly black	16

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|---|---------|------------------------------------|
| 16. Costal region of wings distinctly infuscated ; stigma inconspicuous | | <i>abdominalis</i> Brun. ♂. |
| Wings practically wholly clear ; stigma conspicuous . . . . . | .. .. . | <i>proximus</i> Brun. |
| 17. Wings conspicuously long .. .. . | .. .. . | <i>approximatus</i> Brun. |
| Wings normal .. .. . | .. .. . | 18 |
| 18. Wings nearly clear, legs dark mahogany brown .. .. . | .. .. . | <i>aequalis</i> Brun. ¹ |
| Wings pale brown, legs shining black .. .. . | .. .. . | <i>pallidohirtus</i> , sp. nov. |

Bibio hortulanoides Brun. and **abdominalis** Brun.

It seems impossible to satisfactorily separate the males of these two species. The characters of greater size and browner wings attributed originally to the ♂ of *hortulanoides* are not sustained in subsequent specimens captured in company with undoubted females of the same species. That the two forms are valid species is proved by the females, which are wholly orange brown in *hortulanoides* and wholly shining black in *abdominalis*. The type ♂ and ♀ of the latter species were captured *in cop.* and have remained united. The genitalia of the ♂♂, so far as I can perceive without dissection, offer no separative characters. Some males of intermediate size also eliminate the suggested difference of size as a specific character. One ♂ *hortulanoides*, Ghoom, Darjiling District, undated (*Kemp*); three ♂♂ apparently of *abdominalis* from the same locality (*Kemp*).

Bibio obediens Ost. Sack.

This species, with *rubicundus* Wulp and *flavissimus*, sp. nov., is very closely allied and I was inclined to regard them as synonymous as my new species was the only one of them I had seen. Thanks, however, to Mr. Edwards, who had identified more than one specimen of both *obediens* and *rubicundus* in the British Museum collection, in which the characters set up by Osten Sacken were fully confirmed, I am now convinced of the specific validity of all three. He also pointed out the character of the fore tibial spines, which I had not had the opportunity of testing, with only a single species before me. The species was described from Papua. In the British Museum from the Moluccas.

Bibio rubicundus Wulp.

The characters given in the table of species hold good in the short series of specimens of this species identified by Mr. Edwards in the British Museum. They are from the Malay Peninsula.

Bibio flavissimus, sp. nov.

♀. Assam.

Long. 9 mm.

Head all orange, nearly bare ; eyes black, ocelli at extreme vertex, black, very small and close together. Scapal joints of antennae orange, flagellum black ; last two joints of palpi black.

¹ *Bibio aequalis*, described from Shanghai, is hardly Oriental in the strict sense,

Thorax dull yellowish, ground colour shining, dorsum with yellow pubescence; scutellum concolorous with yellow pubescence.

Abdomen all orange, practically bare, tip a little darker, belly orange.

Legs. Coxae and femora all orange, with yellow pubescence, the former less bright; tibiae and tarsi jet black with black pubescence.

Wings broadly orange yellow on anterior part, the rest pale yellow; veins yellow; halteres orange.

Described from 2 ♀♀ in the Indian Museum from Cherrapunji, Assam, 4,400 ft., 2—8-x-14 (*Kemp*). In the second example (not the type) the hinder part of the thorax and base of abdomen are more or less blackish. Three further ♀♀ from Pashok, Darjiling District, 2,000-3,500 ft., 23-iv—11-v-15 (*Gravelly*); Kalimpong, 600-4,500 ft., 24-iv—10-v-15 (*Gravelly*).

Bibio collaripes, sp. nov.

♂ ♀. Western Himalayas.

Long. 10 mm.

Head wholly black, covered with thick black hairs especially dense and coarser on underside. Antennae with 8-jointed flagellum, black, as are the hairy palpi.

Thorax black, with considerable black pubescence at sides and round margin of dorsum; centre of dorsum sparsely pubescent, (? rubbed). Pubescence above and behind roots of wings dirty yellowish grey. Scutellum black, with a fringe of long erect black hairs around whole margin.

Abdomen all black with thick black pubescence, which is denser on basal half; dorsum of posterior half nearly bare, (? rubbed). Some yellowish hairs on underside near tip.

Legs orange, coxae black, with rather thick black pubescence. Fore femora with some black pubescence at base, increasing just before the middle into a large bushy fringe encircling the limb, beyond which only a little pale short pubescence is present. Middle femora with less dense black pubescence, not forming any fringe, and apparently mainly confined to the lower surface. Orange parts of legs with short concolorous pubescence; upper side of hind femora with some very long well-separated black hairs on basal half. Claws blackish at tips; hind tibiae considerably incrassate, hind metatarsus distinctly so.

Wings clear, costal cell and moderate sized stigma yellowish; halteres black.

♀ *Frons* and occiput with thick bright yellow pubescence extending over upper part of frons towards sides: basal joints of antennae with short bright yellow hairs; 1st palpal joint with short yellow hairs. Anterior half of thoracic dorsum with comparatively sparse yellow hair, also along side margins and around posterior calli. A little yellow hair on pleurae, longer on mesopleura; scutellar hairs yellow. Sides of abdomen with bright yellow, moderately dense pubescence. Legs, except the black coxae, orange yellow with short yellow pubescence; hind legs much less incrassate than in ♂. Wings yellowish, deeper anteriorly; stigma large, just perceptibly deeper still.

Described from 2 ♂♂ (including type) in the Indian Museum from Onari, Garhwal District, Western Himalayas, 11,000 ft., 20-vi-11 (*Col. Tytler*); a further ♂ from Pashok, Darjiling District, 2,000-3,500 ft.,

23-iv—11-v-15 (*Gravelly*), and from one type ♀ taken with the first mentioned ♂♂. The four specimens in the Indian Museum.

The peculiar fringe of pubescence on the fore femora in the ♂ is a decidedly novel character.

The probability of the two sexes herein described representing but a single species was brought to my notice by Mr. Edwards and I have accepted his view.

Bibio obscuripennis de Meij.

Several of this common Himalayan species from Ghoom and Sureil, both Darjiling District, including a pair *in cop.* from the latter place, 11—31-x-17 (*Annandale* and *Gravelly*).

Bibio proximus Brun.

A short series of ♂♂ from the Darjiling District (Lebong, Ghoom Soom, Darjiling), 11—14-vi-14 (*Gravelly*).

Bibio pallidohirtus, sp. nov.

♂. Darjiling District.

Long. 6—7 mm.

Head. Upper facets of eyes bronze brown with short dense black pubescence, their edges almost overhanging the region of small black facets: ocelli large, shining black, contiguous, wholly filling the well elevated ocellar triangle, the latter bearing a few stiff hairs behind. Antennae and palpi all black, underside of head with a little moderately long, brownish yellow rather coarse pubescence. Occiput black, with similar pubescence

Thorax shining black, with some short brownish yellow pubescence; anterior corners of dorsum narrowly brownish orange, shining. Scutellum concolorous with dorsum; pleurae black, bearing some moderately long coarse, yellowish hair.

Abdomen black, with similar pubescence; genitalia large, black (type) or rather dark orange brown (2nd specimen), the claspers with short yellowish hairs. Belly black, with concolorous pubescence.

Legs mahogany brown, femora indistinctly black on upper and under sides; anterior pairs nearly all black; hind femora considerably narrowed basally, making them appear by comparison more strongly clubbed than usual. Pubescence of legs obscurely brownish yellow.

Wings distinctly yellow, a little brownish anteriorly; stigma just obviously darker but not well defined. Halteres dull brownish yellow.

Described from two ♂♂, Darjiling District, Kalimpong, 600-4,500 ft., 24-iv—10-v-15 (*Gravelly*). *Type* and second specimen in Indian Museum.

DESCRIPTION OF A NEW SPECIES OF ORIENTAL
STRATIOMYIDAE: ALSO A CHANGE OF NAME.

By E. BRUNETTI.

Odontomyia angustilimbata Brun., sp. nov.

Brunetti, *Rec. Ind. Mus.* XXV, p. 118, *nom. nud.* (1923).

♀ Ceylon.

Long. 5 mm.

Head. Frons and face much more than one-third width of head, all black, with gradually widening sides, former with very short yellowish hairs, latter with similar whitish hairs. Vertex and ocellar triangle black, ocelli whitish. A roundish orange yellow spot each side of median line of frons, contiguous to base of antennae and to each other: a broad, similarly coloured stripe each side of median line of face, the median line itself being occupied by a rather narrow black stripe. Lower part of head orange yellow; the black colour of the cheeks narrowed greatly on its lower part and continued over the upper mouth edge as a very fine line. Antennal 1st joint distinctly longer than 2nd, both orange brown, 3rd distinctly longer than 1st and 2nd together, dull orange brown, changing to black at tip, the short style black; pubescence of antennae yellowish. Proboscis black; occiput yellow, blackish on upper part.

Thorax. Dorsum and pleurae black, with very short yellowish hairs; scutellum orange yellow; two small concolorous spines.

Abdomen black. Two small elongate yellow spots on hind margin of 1st segment; hind margins of 2nd, 3rd, 4th and 5th segment, also entire side margins of abdomen, narrowly pale yellow. Belly black, 1st segment almost wholly, 2nd on hinder three-fourths, 3rd on about hinder half, and 4th rather narrowly on hind margin yellow. Pubescence of belly yellowish, short, sparse.

Legs. Coxae from base mostly black, rest of legs pale yellow: femora with a rather broad brown median ring, rather indefinite distally; hind tarsi tips blackish.

Wings yellowish grey, veins brownish yellow; 3rd veinlet from discal cell not apparent: halteres pale yellow.

Described from two ♀♀ in the British Museum, Trincomalee, 11-ix-90, *type* (Col. Yerbury); Trincomalee Hot Wells, 7-ix-90. Though this species was included in the table of species in my "Second Revision" (*Rec. Ind. Mus.* XXV, p. 118), the description was inadvertently omitted.

In this paper (*Rec. Ind. Mus.* XXV, p. 154) another error was committed, the name *Sargus splendens* being used for a new species.

This name is preoccupied by Bigot in 1879 for a Mexican species, and I therefore propose the new name *Sargus splendidus*.

NOTES ON FISHES IN THE INDIAN MUSEUM.

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(Plate XI.)

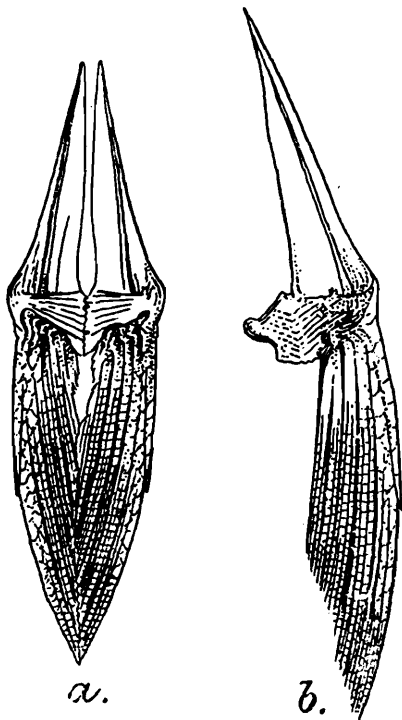
IX. ON A NEW VARIETY OF *Polynemus sextarius* BL. & SCHN.

Professor J. P. Mullan of St. Xavier's College, Bombay, has kindly sent me a few specimens of *Polynemus* for examination with the remark that, "in Bombay the specimens of *Polynemus sextarius* invariably bear seven free pectoral rays and not six as mentioned by Day." It is a recognised fact that in distinguishing the various species of the genus *Polynemus* the free pectoral filaments form very good diagnostic characters. To test the validity of Professor Mullan's remark I have examined a large series of specimens of *P. sextarius* in the Museum collection and have also carefully studied the specimens of other species in this genus in order to find out the extent of variation in the number of pectoral filaments. I have found some variation regarding the number of free pectoral rays in three instances, (i) in a specimen of *P. heptadactylus* there are six filaments on the right and seven on the left side, (ii) in a specimen of *P. tetradactylus* there are four filaments on the right and five on the left side and (iii) in a specimen of *P. sextarius* var. *mullani* there are six free rays on the left and seven on the right side. Professor Mullan's examples from Bombay, though similar to *P. sextarius* in most respects, do not fall within its recognised specific limits, for they possess seven free pectoral filaments and a large, well-developed air-bladder. In my opinion they represent a new variety of *P. sextarius* and I have great pleasure in naming it *mullani* after its discoverer. A specimen of the new variety from Sind in our old collection had been referred to *P. sextarius* by Day. I have examined over a dozen specimens of the new variety.

The air-bladder of *P. sextarius* is described by Günther¹ as "excessively small, pointed at both extremities, of the shape and size of a grain of oats." According to Day² the bladder is "small and simple." In most of the specimens that I have examined the vessel is small and simple, but its relative size appears to diminish with the growth of the fish. In two examples, one from Madras, the original of Day's figure in the Fishes of India and the other from Bombay, the air-bladder is well-developed and extends as far back as the commencement of the anal-fin. In this respect the two specimens agree with var. *mullani*. In *P. heptadactylus* the bladder is stated to be absent both by Günther and Day, but I have found it in a greatly reduced form in young individuals.

¹ Günther, *Cat. Fish. Brit. Mus.* II, pp. 321, 326 (1860).

² Day, *Fish India*, p. 177 (1876).



TEXT-FIG. 1.—Pelvic fin and girdle of *Polynemus sextarius* var. *mullani*, nov.

- a. Normal fin and skeleton.
b. Abnormal skeleton with fin of left side absent.

For a detailed description of the species I can refer to Weber and Beaufort's¹ work on the *Fishes of the Indo-Australian Archipelago*. The same description will suffice for the variety except that the lengths of the various spines in the fins are somewhat variable.

Polynemus sextarius is found in seas from the East Coast of Africa through British India and Ceylon to Siam, and China. The variety *mullani* is so far known from Bombay and Sind.

I have to record here the total absence of the pelvic fin of the left side in a specimen of *Polynemus sextarius* var. *mullani*. The only trace of the skeleton of the missing fin is the basal portion of the basi-ptyerygium, which is fused with the basi-ptyerygium of the right side. In my opinion this abnormality is the result of cessation of development due to external causes during embryonic life or in the early stages of development.

X. ON A NEW SPECIES OF *Brachyamblyopus* BLEEKER.

Professor Meggitt of the Rangoon University has kindly sent me a small collection of fish for determination. In this lot I have found three specimens, which, in my opinion, represent a new species of the genus *Brachyamblyopus*.² In my recent paper³ on the eel-like Gobioid fishes I failed to grasp the generic limits of *Brachyamblyopus* and erroneously referred my new species from the Chilka Lake⁴ to *Trypauchenophrys*,⁵ which I now consider to be a synonym of *Brachyamblyopus*. *Trypauchenopsis* Volz⁶ from Sumatra is characterized by the absence of canines and of the blind pouch-like depressions in the opercular region. In my opinion this last genus is also synonymous with *Brachyamblyopus*. In this note I propose to describe Bleeker's genus in detail along with the description of a new species from Burma.

Genus *Brachyamblyopus* Bleeker.

1874. *Brachyamblyopus*, Bleeker, *Arch. Néer. Sc. Nat.* IX, p. 329.

1902. *Trypauchenopsis*, Volz, *Zool. Anz.* XXVI, p. 555.

1910. *Trypauchenophrys*, Franz, *München Abh. Ak. Wiss. Math.-Phys. Kl. Suppl.-Bd.* IV, p. 68.

Bleeker described this genus from Sumatra and characterized it as, "Dentes utraque maxilla acuti subverticales, serie externa ceteris long-

¹ Weber and Beaufort, *Fish. Indo-Austral. Archipel.* IV, p. 210 (1922).

² Bleeker, *Arch. Néer. Sc. Nat.* IX, p. 329 (1874).

³ Hora, *Rec. Ind. Mus.* XXVI, pp. 155-163 (1924).

⁴ Hora, *Mem. Ind. Mus.* V, p. 757, fig. 34 (1923).

⁵ Franz, *München Abh. Ak. Wiss. Math.-Phys. Kl. Suppl.-Bd.* IV, p. 68 (1910).

⁶ Volz, *Zool. Anz.* XXVI, p. 555 (1902).

iores curvati, canini nulli; intermaxillares biseriati, inframaxillares pluriseriati. Corpus elongatum altitudine 9 ad 10 in ejus longitudine, capite compresso non latiore quam alto obtuso convexo, oculis minimis. Maxilla inferior cirris nullis. Squamae parvae cute quasi immersae. Caudalis tota cum dorsali et anali unita. B. 5. D. 6-29 ad 6-32. A. 28 ad 34."

"Sp. typ. *Amblyopus brachysoma* Blkr." ¹

Without making any reference to *Brachyamblyopus*, Volz, in 1902, described a new genus *Trypauchenopsis* from Sumatra and defined it as, "Diese Gattung unterscheidet sich von *Amblyopus* durch das Fehlen von grossen Caninen, von *Trypauchen* und *Trypauchenichthys* durch den Mangel einer blindsackartigen Vertiefung über dem Operculum." There appears to me no difference between the two genera, but on the other hand it seems quite probable that Volz's *Trypauchenopsis intermedius* is the same species as Bleeker's *Brachyamblyopus brachysoma*. From the descriptions, the two species appear to be almost identical. In 1910, Franz described a new genus—*Trypauchenophrys*—from Japan and diagnosed it as, "Trypauchen-ähnlich, aber unbeschuppt. Kein Loch über dem Kiemendeckel, kein Loch an Stelle des Auges. Die Augen schimmern vielmehr als schwarze Punkte durch die Haut." There are no valid differences between the three genera discussed above and the important points, viz., the absence of canine teeth and of the pouch-like depressions in the opercular region, are common to all of them.

The genus *Brachyamblyopus* may be defined as follows :—

A genus of Gobioid fishes comprising elongated eel-like forms, in which the dorsal, caudal and the anal fins are continuous, there is only one dorsal fin. The ventrals are united to form a cup-shaped disc and the pectorals are small. There are several series of minute and subequal teeth in both jaws and the canines are absent. The scales are either rudimentary or absent. The eyes are small and dorsally approximated. The pouch-like depressions in the opercular region are absent.

The genera of the sub-family Taenioninae may be distinguished by the following key :—

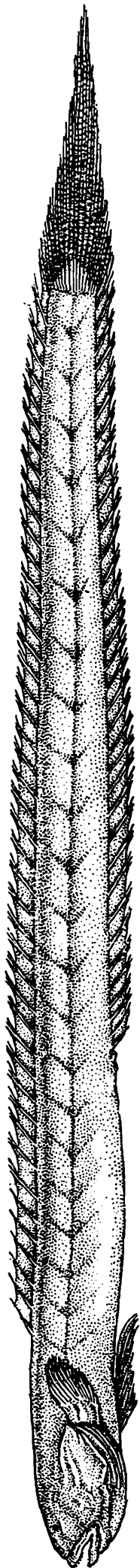
- | | |
|--|-------------------------|
| I. Eyes large; disc formed by the ventrals bipartite | <i>Paragobioides.</i> |
| II. Eyes small; disc formed by the ventrals entire | |
| a. A single series of teeth in each jaw | <i>Tynlastes.</i> |
| b. Several series of teeth in each jaw. | |
| 1. Outer series of teeth produced into well-developed recurved canines | <i>Taenioides.</i> |
| 2. All the teeth subequal, no canines | <i>Brachyamblyopus.</i> |

***Brachyamblyopus burmanicus*, sp. nov.**

D. 6-36/39; A. 33-35; P. 14; V 1/5.

This is a long and narrow species, in which both the dorsal and the ventral profiles are straight and horizontal. The head is depressed from above downwards and the body is compressed from side to side. The length of the head is contained 7.5 to 9.9 times and the depth of the body 14 to 16 times in the total length without the caudal. Both the length

¹ For *Amblyopus brachysoma* see Bleeker, in *Nat. Tijdschr. Ned. Ind.* (n. s.) V, p. 510 (1853).

TEXT-FIG. 2.—Lateral view of *Brachyamblyopus burmanicus*, sp. nov. $\times 2$.

of the head and the depth of the body are proportionately greater in older than in young individuals. The length of the head is 1.2 to 1.4 times its width and 1.6 times its greatest height. The eyes are small and are situated on the dorsal surface. The mouth is small and is directed obliquely upwards. Both the jaws are equal. There are several rows of teeth in both jaws, those of the outer series appear to be slightly longer than the others. There are no canines. The dorsal fin commences slightly behind the pectoral and is continuous with the caudal. The anal is similar to the dorsal. The caudal is very long, it is almost twice the length of the head.

The length of the pectoral is slightly less than half the length of the head and is nearly two-thirds the length of the ventral.

The colour in spirit is uniformly grayish yellow. The middle rays of the caudal fin are black.

The specific limits of the species assigned to *Brachyamblyopus* are not well defined, so it is rather difficult to discuss the relationships of the new species. It is, however, closely related to the Sumatran species, *B. brachysoma*, but differs from it in the possession of fewer rays in the pectoral and a greater number of rays in the dorsal fin.

Locality.—A small pond opening into the Rangoon River about 3 miles below Rangoon.

Type-specimen. :—F 10746/1, Zoological Survey of India (Ind. Mus.).

Measurements in millimetres.

	A	B
Total length excluding caudal	83.3	45.0
Length of caudal	18.5	10.5
Length of head	8.4	6.0
Greatest height of head	5.2	3.6
Greatest width of head	6.7	4.2
Height of body	5.2	3.2
Length of pectoral	4.0	2.7
Length of ventral	6.0	3.5

XI. ON THE FISHES OF THE GENUS *Parapsilorhynchus* HORA.

The genus *Parapsilorhynchus*¹ was erected in 1921 to accommodate Annandale's² *Psilorhynchus tentaculatus* from the Western Ghats and my new species *Parapsilorhynchus discophorus* from the same locality. The latter species was then described from a single specimen, which on comparison with the material of the former species in our collection was considered to be specifically distinct. But since then I have made collections in the Poona and the Satara districts of the Bombay Presidency, and have also examined a number of specimens obtained by our collector, Mr. R. Hodgart, near Khandhalla. The examination of this additional material has convinced me that the two species are identical. The close similarity in the form and structure of the two species has already been pointed out and the differences, on which they were considered to be distinct, vanish altogether when a large series of specimens is examined. In all specimens a callous pad of skin can be made out behind the lower lip. In those specimens, in which this portion is elevated and forms a disc, the lip is not conspicuously bilobed; while in others, in which it is depressed, the disc is absent and the lower lip is distinctly bilobed. All intermediate stages between the form figured in Annandale's paper and that figured in my notes have been observed in the material before me.

The pharyngeal teeth are arranged in two rows and not in three as described by Annandale. There are 5 teeth in the outer row and 4 in the inner. Sometimes worn out teeth are found³ just outside the rows of pharyngeal teeth and, in all probability, the outermost row of 2 teeth mentioned by Annandale was of this nature.

There is a specimen of *P. tentaculatus* from Pachmarhi in our collection. The species is thus found both in the Western Ghats and the Satpura Hills at Pachmarhi.

XII. THE SYSTEMATIC POSITION OF THE CYPRINOID GENUS *Psilorhynchus* McCLELLAND.

In 1839, McClelland⁴ established the genus *Psilorhynchus* to include Buchanan's⁵ two species, viz., *Cyprinus sucatio* and *C. balitora*, from the northern and north-eastern parts of Bengal. He characterized it as, "Muzzle elongated and flattened, eyes placed on the edges of the head, mouth small and suctorial without cirri, opercula small, caudal bifid, dorsal opposite to ventrals." He figured these species from the manuscript drawings of Hamilton Buchanan and gave a short description of each. McClelland had only examined a single specimen of *Psilorhynchus balitora* from Upper Assam and had assigned this genus to his composite subfamily Apalopterinae. In 1868, Günther⁶ included it in the group

¹ Hora, *Rec. Ind. Mus.* XXII, pp. 13-17, text-fig. (1921).

² Annandale, *Rec. Ind. Mus.* XVI, pp. 128, 129, pl. i, figs. 4, 4a, pl. iii, fig. 2 (1919).

³ Annandale & Hora, *Rec. Ind. Mus.* XVIII, p. 165 (1920).

⁴ McClelland, Indian Cyprinidae in *As. Res.* XIX, pp. 300, 428, pl. (1839).

⁵ Buchanan, *Fish Ganges*, pp. 347, 348, 393, 394 (1822).

⁶ Günther, *Cat. Fish. Brit. Mus.* VII, p. 343 (1868); also *Intro. Stud. Fish.*, p. 604 (1880).

Homalopterina and remarked, "I follow McClelland in associating the following genus with *Homaloptera*. Besides its general outward appearance, scarcely anything is known of its characters, and it is not impossible that future researches will assign to it another place in the system." Day,¹ in his monograph of Indian Cyprinidae, assigned *Psilorhynchus* to the subfamily Cyprininae. He had examined a specimen of *Psilorhynchus balitora* in the Calcutta Museum and he found the air-bladder of this example "rather large, divided by a constriction into an anterior and posterior portion and not enclosed by bone." In the *Fishes of India*² and later on in the *Fauna of British India*³ he retained *P. balitora* in the genus *Psilorhynchus* and considered *P. sucatio* as a doubtful synonym of *Homaloptera bilineata* (Blyth).⁴ Moreover, he regarded the genus *Psilorhynchus* as "a connecting link between *Homaloptera* and *Discognathus*." Sauvage⁵ described a new species of *Psilorhynchus* from China, but in his diagnosis he has not referred to the internal characters. Vinciguerra⁶ in 1889 very ably discussed the relationships of *Psilorhynchus* basing his arguments on the evidence then available, and clearly established that Buchanan's *Cyprinus sucatio* is not only not a synonym of *H. bilineata*, but is not congeneric with it. In 1919, Jordan⁷ considered *Psilorhynchus* a synonym of *Homaloptera*, but in 1923,⁸ he definitely assigned it to the family Cobitidae. Annandale⁹ described a new species of *Psilorhynchus* from the Western Ghats and while revising the Indian species of this genus I¹⁰ was greatly influenced by this fresh material in defining the genus. The only other specimens that I examined then were 2 badly preserved examples of *P. balitora* and a few young individuals from the Naga Hills and the base of the Darjiling Himalayas. In 1921, I¹¹ proposed a new genus for Annandale's species but had not enough material to characterize McClelland's genus. In a small collection of fish sent by Mr. G. E. Shaw from the Darjiling Himalayas I¹² was fortunate to find 3 specimens of Buchanan's *Cyprinus sucatio* and later on Drs. Kemp and Chopra brought two more specimens of the same species¹³ from the Siju Cave, Garo Hills, Assam. I have already redescribed this species and have made a few observations on its air-bladder. In this note I propose to describe the pharyngeal teeth of *P. sucatio* and of the young specimens I obtained in the Naga Hills. Unfortunately the two specimens of *P. balitora* in our collection have been so badly handled that I have not been able to find these structures in them. The systematic position of a Cyprinoid genus is chiefly determined by the character of its pharyngeal teeth and the nature of its air-bladder.

¹ Day, *Journ. As. Soc. Bengal* XL, pt. II, pp. 106, 107 (1871).

² Day, *Fish. India*, p. 527, pl. cxxi, fig. 7; cxxii, fig. 3 (1878).

³ Day, *Faun. Brit. Ind. Fish.* I, p. 244 (1889).

⁴ Blyth, *Journ. As. Soc. Bengal* XXIX, p. 172 (1860).

⁵ Sauvage, *Bull. Soc. Phil. Paris.* (7) II, p. 88 (1878).

⁶ Vinciguerra, *Ann. Mus. Civ. Stor. Nat. Genova* (2) IX, pp. 192-207 (1890).

⁷ Jordan, *The Genera of Fishes* II, p. 195 (1919).

⁸ Jordan, *The Classification of Fishes*, p. 145 (1923).

⁹ Annandale, *Rec. Ind. Mus.* XVI, pp. 128, 129, pl. i, figs. 4, 4a; pl. iii, fig. 2 (1919)

¹⁰ Hora, *Rec. Ind. Mus.* XIX, pp. 207-212 (1920).

¹¹ Hora, *Rec. Ind. Mus.* XXII, pp. 13-17 (1921).

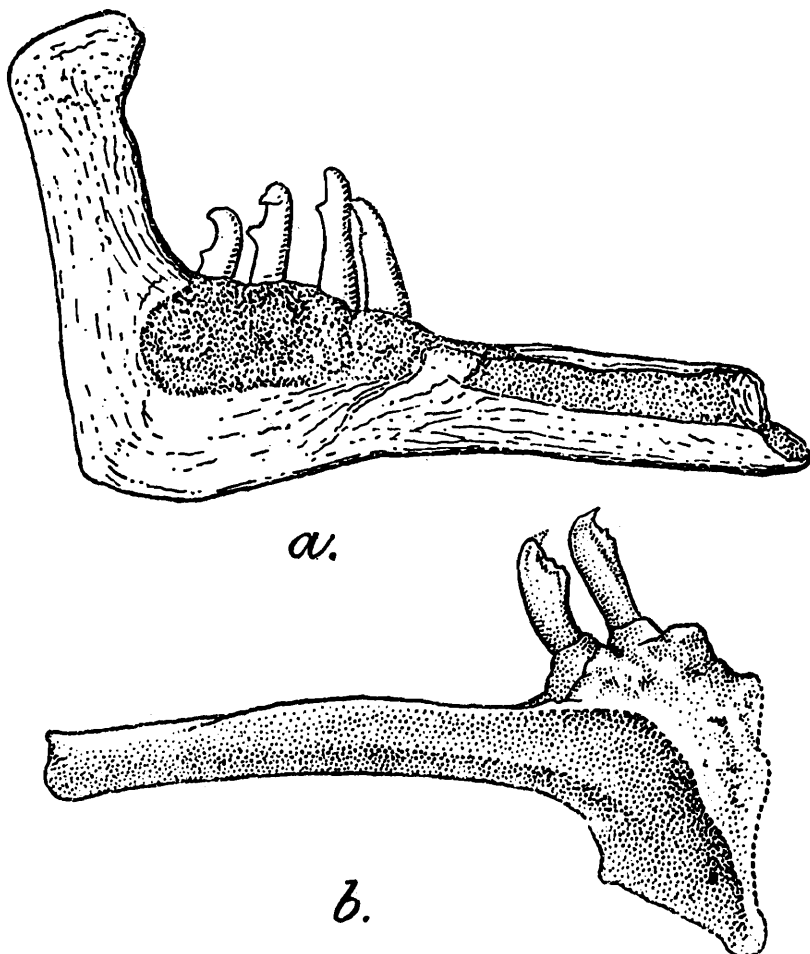
¹² Hora, *Rec. Ind. Mus.* XXII, pp. 731-733, pl. xxix, figs. 1, 1a. (1921).

¹³ Hora, *Rec. Ind. Mus.* XXVI, p. 27 (1924).

The pharyngeal bones are very slender and each bears 4 teeth, which are arranged in a single row. Each tooth is sharp and pointed and is more or less sickle-shaped near its apex. Such normal teeth are found only in young specimens from the Naga Hills; while in the preparations of *P. sucatio* one or two normal teeth are present and the remaining are of the nature of flat teeth with truncate crowns. The apex of such a flat tooth is somewhat crenulated. The material at present available does not permit any discussion regarding the form of the teeth, but the fact, that in all preparations there are four teeth arranged in a single row, is very significant.

I have already pointed out that the bladder in *P. balitora* shows progressive degeneration. On an examination of a number of specimens of *P. sucatio* I have come to the same conclusion. The posterior chamber is greatly reduced and the anterior is covered with a thick, fibrous coat. In some specimens bony processes from the adjoining vertebrae have partially enclosed the anterior chamber.

From the arrangement of the pharyngeal teeth and the presence of a number of simple rays in the paired fins it is clear that *Psilorhynchus* does not belong to the family Cyprinidae. The absence of barbels and the presence of a free bladder in the abdominal cavity separate it from the Homalopteridae. From the Cobitidae it is distinguished by the presence of large scales, by the presence of several simple rays in the



TEXT-FIG. 3.—Pharyngeal bone and teeth of fishes of the genus *Psilorhynchus*.
a. *Psilorhynchus* sp. (Naga Hills). *b.* *Psilorhynchus sucatio* (Ham. Buch.).

horizontally placed paired fins, by the absence of barbels and in its general facies. I propose for it a new family—Psilorhynchidae, which may be defined as follows :—

The family Psilorhynchidae comprises small hill-stream species, in which the back is greatly arched and the under surface is flattened. The snout is broad and spatulate ; it is elongated and flattened. The eyes are large and are situated at the sides of the head ; they are usually visible from below. The mouth is small and is situated considerably behind the tip of the snout. The barbels are absent. The dorsal is situated slightly in advance of the ventral and the paired fins are horizontally placed ; at least 4 outer rays of the pectoral and 2 of the ventral are simple. The gill-openings are narrow. The gill membranes are united with the isthmus. There are no pseudobranchiae. The pharyngeal bones are slender and there are 4 teeth on each which are arranged in a single row. The air-bladder is of the normal form but is greatly reduced ; it is either entirely free in the abdominal cavity or is partially covered by bone. The posterior chamber is very small and the anterior is covered by a thick fibrous coat.

XIII. ON CERTAIN NEW AND RARE SPECIES OF " PIPE FISH "

(FAM. SYNGNATHIDAE).

In 1913, our entire collection of Syngnathid fishes was sent to Dr. Georg Duncker of Hamburg for determination, and he incorporated the results of his investigations in his excellent paper on the revision of the family.¹ Since then more material has accumulated chiefly through the efforts of the Surgeon Naturalist to the Marine Survey of India and in this paper I have described and figured some new and interesting forms found in this additional material. I have erected a new genus for Weber's *Syngnathus corrugatus*² and have described a new species in the same genus. Another new form has been provisionally referred to *Syngnathus*, and a note has been added on three young specimens in the collection which I have doubtfully named as *Corythoichthys fasciatus*. *Syngnathus argyrostictus*, which has hitherto been known only from the Far East, is here recorded from two places in Indian waters. The presence in our collection of Weber's two interesting species, viz., *S. corrugatus* and *S. uncinatus*,³ from the Malay Archipelago, is of special interest as each of these has so far been known from a single immature specimen.

Genus *Syngnathus* Linn.

Syngnathus (?) *uncinatus* Weber.

1913. *Syngnathus uncinatus*, Weber, *Siboga-Expeditie, Fische*, p. 110, fig. 36.

1915. *Syngnathus* (?) *uncinatus*, Duncker, *Mitt. Naturh. Mus. Hamburg XXXII*, p. 86.

1922. *Syngnathus* (?) *uncinatus*, Weber and Beaufort, *Fish. Indo-Austral. Archipel. IV*, p. 84, fig. 35.

This species is represented by a single young specimen in our collection. It is 55 mm. in length and was obtained by Major Sewell in Octavia

¹ Duncker, *Mitt. Naturh. Mus. Hamburg XXXII*, pp. 9-120 (1915).

² Weber, *Siboga-Expeditie, Fische*, p. 112 (1913).

³ Weber, *op. cit.*, p. 110 (1913).

Bay (Nankauri Harbour) at a depth of 12 fathoms on a bottom of sand and mud. It agrees very closely with Weber's description and figure and differs slightly in details of colour marking. The colour bands in the caudal region are better defined and the longitudinal brown patches below the dorsal and the lateral part of the trunk are absent.



TEXT-FIG. 4.—Lateral view of head and anterior part of body of *Syngnathus (?) uncinatus* (Weber) $\times 8$.

Weber based his description on a single specimen 60 mm. in length found on the reef at Banda. My specimen is also young and it is difficult to be sure of its generic position.

Localities.—Banda and Octavia Bay (Nankauri Harbour). (Marin Survey Sta. 614.)

***Syngnathus argyrostictus* Kaup.**

(Plate xi, fig. 6.)

1922. *Syngnathus argyrostictus*, Weber and Beaufort, *op. cit.*, p. 82.

There are altogether 15 specimens in our collection which I refer to this species; of these three were obtained by the late Dr. Annandale in the Ennur backwater near Madras, while the remainder were collected by Dr. Kemp in the Marmugoa Bay (Portugese India). The species has hitherto been known only from the Far East (Malay Peninsula, Penang, Formosa, Japan and South of China) and its occurrence in Indian waters at two different places is of great interest. The specimens agree in all particulars with Duncker's (*op. cit.*, p. 84) description of the species and I give a figure to show slight differences in colouration, etc.

***Syngnathus (?) investigatoris*, sp. nov.**

(Plate xi, fig. 4.)

D. 23 ; P. 15 ; C. 12 ; Rings 15+33 ; subdorsal, 1+4.

This is a small and slender species in which the ventral keel is fairly prominent, the trunk is heptagonal and the tail tetragonal. The shields are indistinctly striated transversely and their margins are prominent but smooth. The intermedial shields are oval and well developed. The superior cristae of the trunk terminate near the posterior border of the third tail shield; these are not continuous with the superior cristae of the tail, which are deflected anteriorly and terminate near the anterior border of the first tail shield quite close to the termination of the median cristae of the trunk. The inferior cristae of the trunk are continuous with those of the tail. The length of the head is contained about 7.5 times in the total length without the caudal and is little more than twice in the length of the trunk. The snout is shorter than the postorbital part of the head and is twice the diameter of the eye; it is cylindrical

and possesses a prominent, smooth, median keel on the dorsal surface extending as far back as the narrow interorbital region. There is a low median crest on the head and a more prominent one on the nape and the nuchal shield. There are low ridges commencing from the middle of the orbit and extending backwards for a distance equal to the diameter of the orbit. The operculum is provided with a low curved keel, which is bent upwards and under a high power lens can be traced as far back as the gill-opening. There are lines radiating from the keel. The base of the dorsal is slightly elevated above the dorsal profile. The pectoral, anal and caudal fins are fairly well developed.

The colour in spirit is very characteristic of the species. It is yellowish brown with about 10 annular bands of deeper colour situated at almost equal intervals, one on every fifth segment. There are lighter bands placed at the junctions of the shields; these bands become broader and more marked near the inferior cristae and along the ridge each encloses a white spot in the middle. The middle portion of each shield along the inferior ridge is conspicuously white and thus a series of white spots is formed longitudinally. The sides of the snout and the cheeks are deep brown. There is a whitish longitudinal streak on the sides of the snout just in front of the eye.

Locality.—There are two specimens in our collection collected by Major Sewell in the Mergui Harbour in a large surface net (Marine Survey Sta. 581).

Relationships.—Both the specimens in the collection are young and, therefore, I am not certain about the generic position of the species. From the nature of the opercular keel it seems quite probable that it may belong to the sub-genus *Siphostoma* of the genus *Syngnathus*. It is very closely allied to Weber's *S. punctatus*,¹ but can be readily distinguished from it in the possession of a snout shorter than the post-orbital part of the head and in its characteristic colouration.

Type-specimen.—F 10723/1, *Zoological Survey of India (Ind. Mus.)*

Genus *Corythoichthys* Kaup.

(?) *Corythoichthys fasciatus* (Gray).

(Plate xi, fig. 1.)

There are three young specimens in our collection which I refer to *Corythoichthys fasciatus* with great reserve and after a considerable amount of hesitation. To facilitate reference in future I give below a description of these specimens with a figure.

D. 28; Rings, 16+37, subdorsal rings, 2nd caudal to 7th.

It is a long and slender fish in which the ventral keel is prominent. The trunk is heptagonal and the tail tetragonal. The shields are coarsely

¹ Weber, *Siboga-Expeditie, Fische*, p. 113 (1913), and Weber and Beaufort *Fish. Indo-Austral. Archipel.* IV, p. 86, fig. 36 (1922).

serrated transversely and their edges are prominent and smooth. The intermedial shields are present; they are more marked in the tail region and are somewhat sunk below the level and probably contain the lateral line organs. The superior cristae of the trunk terminate on the 5th caudal shield and are not continuous with those of the tail. The superior cristae of the tail are deflected below the dorsal and are continued to the beginning of the first caudal shield. The median cristae of the trunk terminate slightly below the superior cristae of the tail. The superior cristae of the trunk and the tail are continuous. The length of the head is contained about 8 times in the total length excluding caudal and 2 times in the length of the trunk, which is contained slightly less than $2\frac{1}{2}$ times in the length of the tail. The length of the snout is almost equal to the remaining part of the head. There are low median crests on the snout, on the head behind the eyes and on the occipital and nuchal shields. Low ridges also run from the margin of the orbits backwards for a short distance. The opercular keel is prominent and rectilinear. There is a short ridge below the orbit and another just in front of the base of the pectoral.

The colour in spirit is yellowish. There are 5 to 6 gray circular bands situated at almost equal distances in the tail region. The caudal fin is blackish with dull white margin. The head is of a lighter colour than the body.

Locality.—The 3 young specimens in our collection were obtained by Major Sewell in surface nets in Morrison Bay, Mergui Archipelago (Marine Survey Sta. 574 and 578).

Relationships.—These young examples are very similar to Weber's *Corythoichthys crenulatus*,¹ but in them the ridges on the head, body and operculum do not show any sign of serrature. Moreover, the origin of the dorsal is on the last trunk shield in *C. crenulatus*, while it is on the second tail segment in the juvenile specimens. In this last respect they differ from adult specimens of *C. fasciatus*, of which I have not examined any young specimen. At first sight these examples were considered to be the young of *Syngnathus spicifer*, but in them the median cristae of the trunk are subcontinuous with the superior cristae of the tail, while in *S. spicifer* the median trunk cristae are strongly deflected on the last trunk ring and become continuous or subcontinuous with the inferior cristae of the tail.

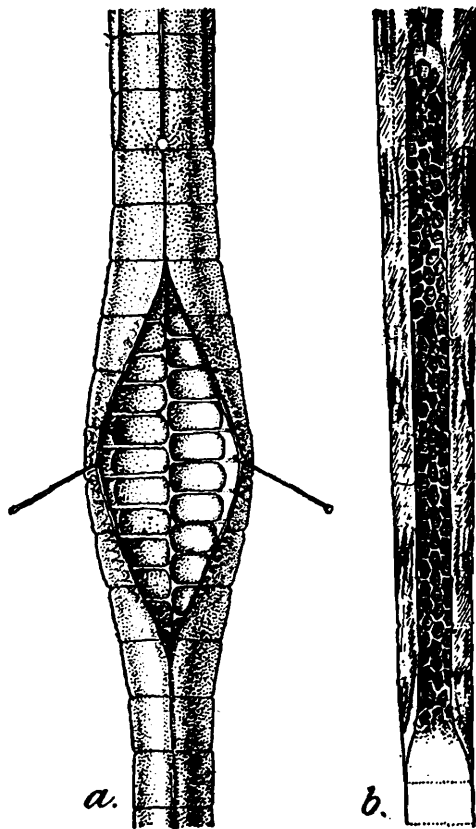
Genus **Bhanotia**, nov.

The genus *Bhanotia* may be defined as follows:—

It is a genus of Syngnathidae comprising short and relatively stout fishes. The shields are finely corrugated transversely and the ridges are fairly prominent and serrated. The snout is slender and is equal in length to the postorbital part of the head; its ventral profile almost forms a straight line with the ventral profile of the head. The snout is provided with a few spines on its dorsal surface. The dorsal profile

¹ Weber and Beaufort, *Fish. Indo-Austral. Archipel.* IV, p. 72, fig. 30 (1922).

of the head rises abruptly in the orbital region and forms an angle with the dorsal profile of the snout. The eyes are prominent. The occipital and the nuchal shields are provided with median crests, which are serrated. The supraorbital ridges, which are serrated, are continued on to the occiput. The operculum is crossed by a complete, longitudinal and serrated keel. The superior cristae of the trunk and tail are discontinuous. The inferior cristae of the trunk and tail are continuous. The median cristae of trunk and the superior cristae of tail are subcontinuous. The intermedial shields or scutella are present or absent. The prenuchal and the nuchal shields are present. The tail is more than twice as long as trunk. The dorsal is situated mostly on the anterior caudal rings. The anal, the pectoral and the caudal are present.



TEXT-FIG. 5.—Brood pouches of the genera *Corythoichthys* and *Bhanotia*.

a. *Bhanotia* $\times 3\frac{1}{4}$

b. *Corythoichthys* $\times 2\frac{1}{4}$.

The eggs are large and are arranged in two rows, they are placed in isolated open cells in the caudal region of the male and are laterally protected by ventrally converging folds of skin, which meet in the midventral line, opening out lengthwise to let out the young fishes.

Relationships.—The genus *Bhanotia* is closely allied to *Corythoichthys* Kaup from which it differs in the character of the brood pouch, in the size and number of eggs and in the fact that all the prominences on the head and body are serrated. The snout is short and on its dorsal surface is provided with spines.

I have called this genus after the name of my esteemed friend Mr. Kali Das Bhanot.

Distribution.—Karakelang Islands (Malay Archipelago) and Rutland Island (Andamans). These fishes are usually found living on coral reefs near the shore.

Type species.—*Bhanotia corrugatus* (Weber).

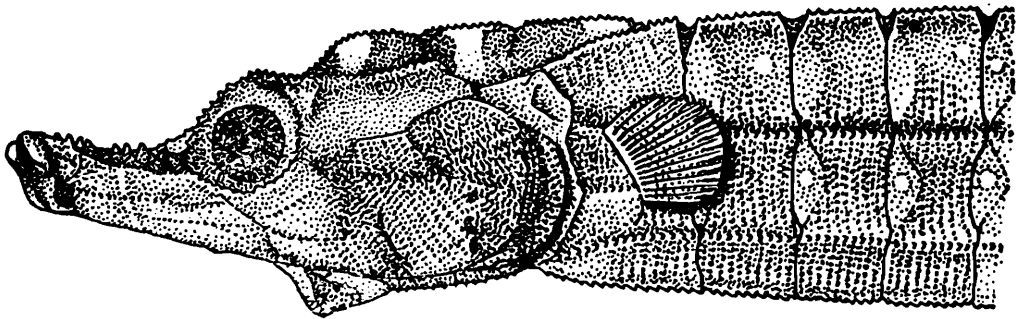
? *Bhanotia corrugatus* (Weber).

(Plate, xi, fig. 2.)

1922. *Corythoichthys corrugatus*, Weber and Beaufort, *op cit.*, p. 72, fig. 30.

Weber described this species from a single specimen 65 mm. in length from Karakelang Islands. In the collection of the Indian Museum there is a specimen 79 mm. in length collected by Major Sewell at the extreme north end of Rutland Island (Andamans). Our specimen agrees fairly closely with Weber's description and figure of the species, but differs in the fact that it is provided with intermedial shields (scutella). There are other minor differences in colouration and proportions, but

these are in all probability due to the age of the two specimens. The differences in proportions can be made out by a reference to the table of measurements. The fin formula, etc., is :—D. 30 ; P. 14 ; Rings 15 + 43 ; subdorsal 1 + 7.



TEXT-FIG. 6.—Lateral view of head and anterior part of body of ? *Bhanotia corrugatus* (Weber) $\times 7$.

The brood pouch begins from the commencement of the first caudal shield and extends over eleven rings. The lateral plates in this region are better developed to give support to the chamber, but the walls of the chamber are mainly formed by cutaneous folds, which meet in the midventral line. There are 16 to 17 rows of embryos on each side ; these are placed in separate cells isolated by thin folds of skin. The portion of the brood pouch on the 10th and 11th caudal shield is empty.

Measurements in millimetres.

Total length excluding caudal	. . . . .	79.0
Length from tip of snout to anus	. . . . .	27.0
Length of head	. . . . .	7.1
Greatest depth of body	. . . . .	5.0
Length of snout	. . . . .	3.9
Diameter of eye	. . . . .	1.6
Length of pectoral	. . . . .	1.6
Length of caudal	. . . . .	2.0

***Bhanotia sewelli*, sp. nov.**

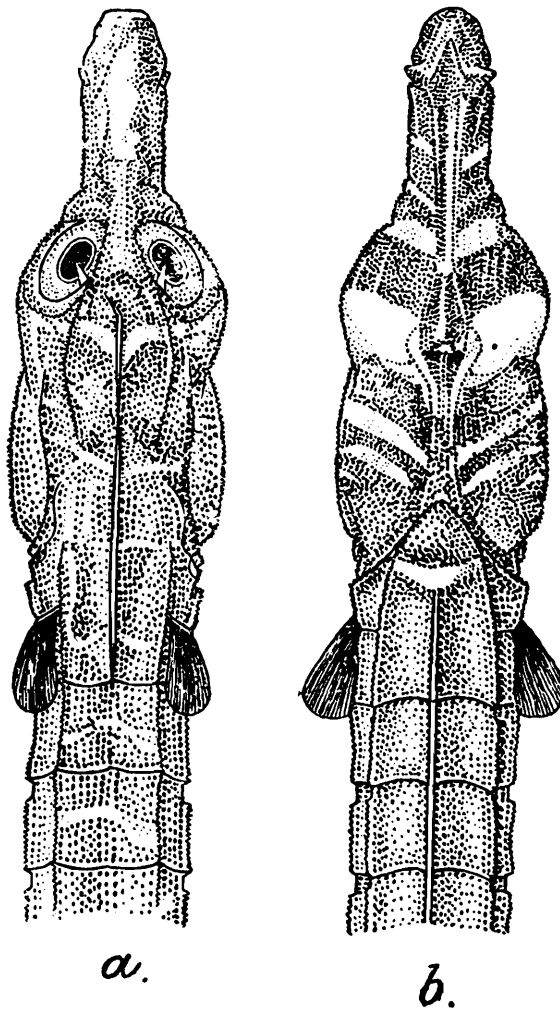
(Plate xi, fig. 5.)

D. 31 ; P. 16 ; A. 3 ; C. 10 ; Rings 15 + 43 ; subdorsal 1 + 6.

In this species the ventral crista is very prominent, the trunk is heptagonal and the tail tetragonal. The length of the trunk is contained 2.3 times in the length of the tail. Both the head and the body are corrugated. All the ridges on the head and the edges of the shields are prominent and serrated. The intermedial shields (scutella) are absent. The length of the head is contained 9.8 times and the depth of the body 20.3 times in the total length without the caudal. The length of the head is contained 2.6 times and the depth of the body 5.5 times in the length of the trunk. The snout is short and slender ; it is shorter than the postorbital part of the head and is one and a quarter times the diameter of the eye ; anteriorly it is turned upwards and its dorsal profile forms an angle with the dorsal profile of the head which rises abruptly in the orbital region. The orbits are very prominent. There are a number of spines along the middorsal line of the snout, these are continued as a

low crest in the interorbital region for a short distance. There is a well-marked, interrupted crest on the nape. In front of and along the inner border of each nostril there is a prominence with about 3 spines; similar prominences bearing 4 spines are obliquely placed slightly behind the tip of the snout one on each side. The orbital borders are also serrated and from their middle curved ridges run as far back as the end of the occiput. There are low ridges on the under surface of the snout. The operculum is provided with a well-developed, longitudinal keel and a number of low radiating ridges. The superior cristae of the trunk extend as far back as the origin of the 28th dorsal ray, but are not continuous with the superior cristae of the tail. The superior cristae of the tail extend almost to the anterior border of the first caudal shield. The median cristae of the trunk end below the superior cristae of the tail and are almost subcontinuous with them. The inferior cristae of the trunk and tail are continuous.

The colour in spirit is very characteristic of the species. It is uniformly gray with light, white streaks on the back, one corresponding to each shield. In the posterior region of the tail these white streaks are continued on to the sides. There is a series of about 7 small, rounded spots on the anterior trunk shields between the inferior and the median



TEXT-FIG. 7.—*Bhanotia sewelli*, sp. nov.

a. Upper surface of head and anterior part of body. *b.* Under surface of head and anterior part of body.

cristae. There are faint indications of one or two other rows of spots

also. There is a V-shaped white band on the head running from eye to eye and pointed backwards in the middle. The mid-dorsal surface of the snout and the anterior half of the interorbital region is also white. On the under surface of the head there is a broad V-shaped band running between the posterior margins of the eyes and sharply directed backwards in the middle. Behind it there are three narrower bands and in front of it is a broad transverse band. The tip of the snout is white and there are one or two broken white lines behind it.

Locality.—This species is represented by a single young specimen in our collection. It was obtained by Major Sewell on the coral reef at the South Point of Outram Island (Andamans).

Type-specimen.—F 10690/1, *Zoological Survey of India (Ind. Mus.)*.

Bhanotia sewelli is readily distinguishable by its characteristic colouration.

I have named this fish after Major R. B. Seymour Sewell, formerly Surgeon Naturalist to the Marine Survey of India and now Director, Zoological Survey of India.

Measurements in millimetres.

Total length excluding caudal	60.9
Length from tip of snout to anus	22.7
Length of head	6.2
Greatest depth	3.0
Length of snout	2.0
Diameter of eye	1.6
Length of pectoral	0.9
Length of caudal	2.0

Genus **Ichthyocampus** Kaup.

Ichthyocampus bannwarthi Duncker.

(Plate xi, fig. 3.)

1915. *Ichthyocampus bannwarthi*, Duncker, *Mitt. Naturh. Mus.* XXXII, p. 93.

There is a single specimen of this species in our collection. It is about 120 mm. in total length and was collected by Major Sewell at Tor (Sinaitic Peninsula) while stationed there in 1917. It agrees very closely with Duncker's description of the species. The edges of the shields are not prominent and it is rather difficult to count the number of rings. Some of the dermal filaments appear to have fallen off in the specimen.

Locality.—Suez.

Genus **Doryichthys** (Kaup) Duncker.

Doryichthys insularis Hora.

1925. *Doryichthys insularis*, Hora, *Rec. Ind. Mus.* XXVII, p. 38, p. ii, fig. 1.

Besides the six specimens collected by the late Dr. Annandale in a small stream at Birchgunge (S. Andamans), there are two more speci-

mens obtained by Dr. Kemp in a rocky stream at Corbyn's Cove, North (S. Andamans). In colouration and general facies this species is similar to Duncker's *Doryichthys ocellatus* from Ceylon, but differs in the possession of fewer rays in the dorsal fin and in having a greater number of trunk shields.

Locality :—South Andamans.

XIV ON A NEW SPECIES OF THE GENUS *Kanduka* HORA.

Quite recently I¹ described this interesting genus from a single specimen obtained at the mouth of the river Hughli at a depth of 15 fathoms. In the late Dr. Annandale's collection from the Ennur backwater near Madras I have found a small specimen, which is congeneric with *Kanduka michiei*, but in certain respects is more highly specialized than the geno-type. I propose for it the name :—

***Kanduka annandalei*, sp. nov.**

When fully inflated it is a spherical ball-like fish with the mouth situated almost in the middle of the anterior surface. The length of the fish is slightly greater than either its height or its breadth. The back is somewhat flattened and there is a raised area along the middle of the back longitudinally. The length of the head is almost equal to half the total length without the caudal. The eyes are situated much nearer to the tip of the snout than to the gill-openings. The greatest diameter of the eye is contained 3.5 times in the length of the head. The snout is almost as long as the diameter of the eye. The interorbital surface is broad and is greater in length than the diameter of the eye. The eyes are covered by adipose eyelids. There are clear oval patches of translucent skin below and behind the eyes. The nostrils are situated nearer to the eyes than to the tip of the snout. Each nostril consists of two broad flaps, which are joined at the base and are imperforate in the centre. The mouth is small and transverse and both the jaws possess well marked median sutures. The lips are fleshy, papillated and continuous at the angle. The gill-openings are very small.

The dorsal and the anal fins are totally absent. The pectoral consists of 17 rays and is situated along with the gill-opening in a pouch-like depression; it is spiral in its horizontal axis and is rather difficult to spread out. The caudal is fairly long and can be retracted into a well-marked pouch. The caudal is also spiral and is truncate at the apex. Below the pouch containing the caudal fin there are two more depressions, one of which probably lodges the anus.

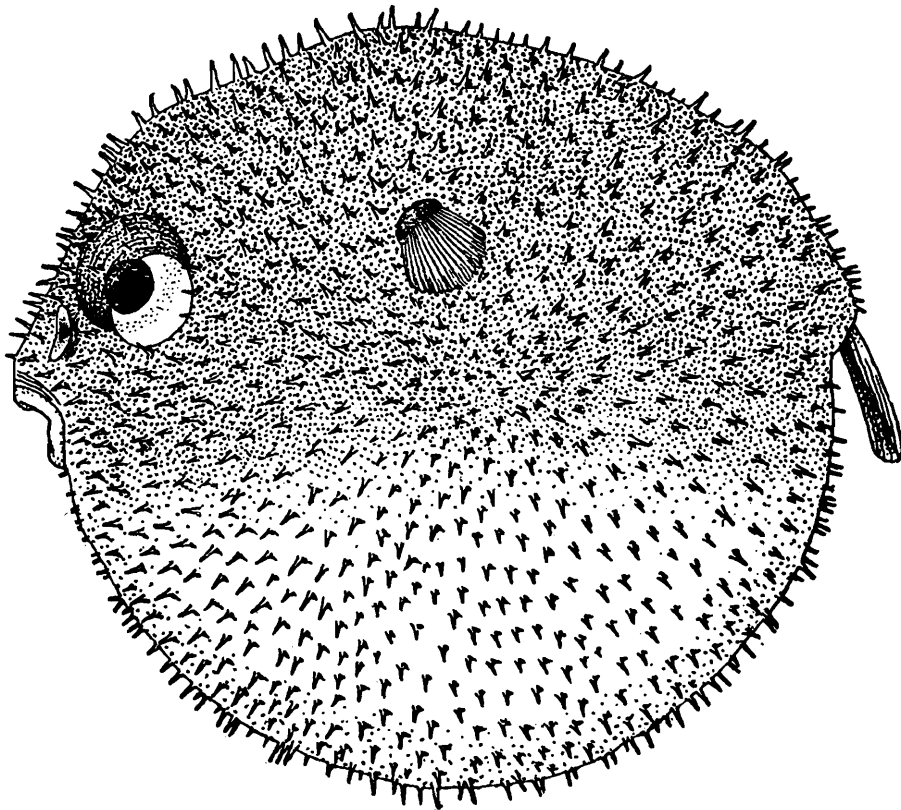
The entire fish, except the lips and the bases of the fins, is covered with long and pointed spines. The spines are absent from the translucent patches below the eyes and are tri- or tetra-radiate at the base.

The colour in spirit is grayish brown above and dull white below. The gray colour of the upper surface is due to the presence of a series of minute spots, which are definitely arranged to form a sort of a dendritic pattern.

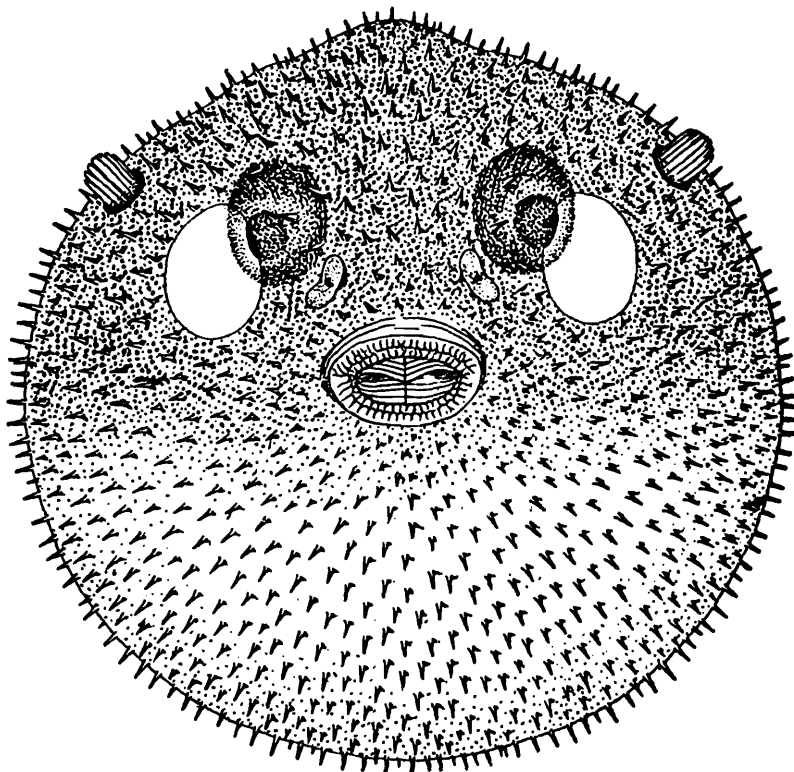
The total length of the specimen is 14 mm. without the caudal fin.

¹ Hora, *Rec. Ind. Mus.* XXVI, 1 p. 519—522, pl. xxxiv (1924).

Locality.—Ennur backwater, near Madras. A single specimen was obtained with a D-net along with the young ones of *Tetraodon patoca* Ham. Buch.



a.



b.

TEXT-FIG. 8.—*Kanduka annandalei*, sp. nov.

a. Lateral view of the type-specimen $\times 7$. b. The same as seen from in front $\times 7$.

Type-specimen.—F 10736/1, Zoological Survey of India (Ind. Mus.).

EXPLANATION OF PLATE XI.

Indian Syngnathidae.

- Fig. 1.—Lateral view of *Corythoichthys fasciatus* (Gray) $\times 3\frac{1}{2}$.
Fig. 2.—Lateral view of *Bhanotia corrugatus* (Weber) $\times 2\frac{1}{2}$.
Fig. 3.—Lateral view of *Ichthyocampus bannwarthi* Durcker $\times 1\frac{4}{5}$.
Fig. 4.—Lateral view of *Syngnathus* (?) *investigatoris*, sp. nov. $\times 5$.
Fig. 5.—Lateral view of *Bhanotia sewelli*, sp. nov. $\times 3$.
Fig. 6.—Lateral view of *Syngnathus argyrostictus* Kaup $\times 2$.



NOTE ON LUMINESCENCE IN THE EARTHWORMS OF RANGOON.

By G. E. GATES, *Judson College, Rangoon, Burma.*

Professor Meggitt of University College has very kindly handed to me a report on luminescence in an earthworm made by one of his students, F. J. Nahapiet, together with the worm on which the observations were made. The worm is *Eutyphœus peguanus*, and the report is as follows:—“The earthworm was found crawling across a macadamized road after a heavy shower of rain, one evening at about eight o'clock. Upon picking up the worm it was found that the portion held between the fingers emitted a faint, whitish phosphorescence. To obviate the possibility of foreign matter causing the phosphorescence the worm was thoroughly washed with water. The worm when rubbed exuded a whitish substance which covered the fingers causing for a few minutes a faint glow gradually fading away. The light was sufficient to show the general shape of the worm but not the segments. The breaking of the worm caused the cessation of the experiment.”

So far as it has been possible to determine from the literature at hand there is no previous record of luminescence of earthworms from India. Harvey in his Monograph on “The Nature of Animal Light” lists seven genera of Oligochæta that contain photogenic species. Of these, five, *Lumbricus*, *Allolobophora* (*Eisenia*), *Microscolex*, *Enchytraeus*, and *Octochætus*, are found in India. Only one specimen of *Microscolex* and that *M. phosphoreus* (doubtless a luminescent form) has been reported from India (at Peshawar). *Lumbricus* and *Allolobophora* are almost entirely represented here by peregrine immigrants, *Enchytraeus* is aquatic *Octochætus* is found only throughout India and New Zealand. The luminescence possibly has been reported from the New Zealand species of the genus. Our knowledge of the Indian Oligochæta is very largely based on the study of museum specimens which are not usually gathered under conditions that would make possible observations on the light producing powers of these animals.

It has not been possible in the experiments reported herewith to rely on worms found above-ground in the night. It has been necessary in order to secure an adequate supply of material of the various species to rely on worms obtained by digging. The worms secured in this way in the afternoon have been brought into the laboratory at about four or five o'clock when they have been sorted at once and placed according to species in glass jars where they have been left until eight o'clock or later. Of the twenty-two species of earthworms of Rangoon only seventeen could be secured at the season of the year when these experiments were carried on. The majority of these have no luminescent phenomena and require no further mention.

The worms left in the glass jars as previously mentioned have never been observed to emit luminous mucous although large masses of worms have been left in this way for long periods of time. Allowing the worms

to crawl on dry and wet, rough or smooth surfaces has failed to result in the production of light. Rubbing gently and shaking violently in water have also produced no positive results. In the laboratory conditions under which the present work has been conducted the luminescence has only been obtained by the more violent mechanical stimuli such as cutting, pinching, pricking, or crushing, or by chemical stimulation secured by immersion of the worm in methylated spirits, or weak solutions of various substances such as ammonium hydroxide, chloretone, etc. If a worm is dropped into methylated spirits and then quickly removed so that the ejected mucous still clings to the worm, patches of faint glow appear that may last for an hour or more. The mucous or worm in the methylated spirits never luminesces. The most satisfactory method of demonstrating the photogenic ability of the worm is to drop the animal into a finger bowl containing a very weak solution of ammonium hydroxide in water. The worm lies quietly for a moment and then commences to writhe around in a rather deliberate fashion. After a varied amount of this writhing, mucous is suddenly shot out from the dorsal pores along more or less the whole length of the body. The light is not produced immediately on the discharge of the mucous but appears only after the lapse of a short interval, the light gradually increasing until it reaches a maximum amount. As the photogenic capacity of the species vary it is desirable to discuss each one separately.

Eutyphæus peguanus.—The luminescent masses of mucous produced in the ammonia solution are varied in size, many much larger than the head of a pin. At first they are scattered throughout the water in the bowl but if the worm is removed or becomes quiet, the glowing masses slowly sink to the bottom. The light is whitish and bright enough to enable one to see clearly the features of countenance and garb of those watching the phenomena. If undisturbed the mucous masses glow for several hours. If the water is agitated violently enough by the writhing of the worm or by stirring with a rod, the luminescent substance becomes evenly distributed throughout the liquid and the amount of light given off appears to be much reduced. If the liquid is now filtered some of the luminescent substance passes the filter. The filtrate shows the so-called Tyndall effect, indicating the presence of a substance in colloid condition. This is presumably the luminescent substance as it hardly seems possible that such a substance could be in solution.

The worm is not pigmented and the internal organs show clearly through the transparent body wall. At no time during the course of the experiments has any luminescence been noted within the body of the worm of this or any other species.

Eutyphæus foveatus.—Worms of this species writhe around in the finger bowls of ammonia solution much longer before discharging the mucous than the preceding species. The amount of light produced by a single mature worm is much less than that produced by the preceding worm although the two are about the same size. The luminous masses of mucous are about the same as in *E. peguanus*. But the number of glowing masses produced is usually smaller.

This worm is heavily pigmented, having a deep rich brown colour dorsally and laterally.

Eutyphæus rarus.—This worm is extremely rare in Rangoon, and it has been possible to obtain only four specimens for use in these experiments. One failed to give any visible luminescence at all when stimulated mechanically by pricking, cutting, and crushing. The other three were treated with the ammonia solution. Of these two gave positive results. In both of these worms the luminescence was confined to two small masses of mucous which glowed less than five minutes each. At the end of that period the light had entirely disappeared.

This, like the preceding worm, has a deep brown colour dorsally and laterally. It is slightly smaller than both the other species.

Only these three species of the genus *Eutyphæus* are to be found in Rangoon and all of them are able to produce, under certain conditions, varying amounts of luminescence. As this phenomenon has been reported from the related genus *Octochætus* numerous efforts have been made to obtain the glow in the mucous of *O. birmanicus*, the only species of this genus which occurs in Rangoon. None of these attempts have succeeded. The only other Rangoon worm with photogenic ability belongs to a quite different genus.

Megascolex mauritii.—A single specimen of this worm when dropped into the ammonia solution ejects after considerable writhing fine mucous masses which glow faintly for a short time only, usually less than five minutes. The amount of light produced by one of these worms is very small and visible only in absolute darkness. A bowl containing a single specimen of *E. peguanus* or *E. foveatus* in the near vicinity is bright enough to prevent the light being seen. If some thirty or forty of these worms are dropped together into a bowl, light equivalent, roughly speaking, to that produced by one *E. peguanus* is liberated, and the mucous masses thus formed glow for several hours.

This worm like *E. peguanus* is unpigmented, with transparent body wall, and like *O. birmanicus* is the only species of the genus which occurs in Rangoon.

SUMMARY.

Four species of the earthworms which occur in Rangoon, three belonging to the genus *Eutyphæus*, and one to the genus *Megascolex*, eject from the dorsal pores, after certain mechanical and chemical stimulation, a mucoid substance which luminesces in various degrees according to the species of the worm producing it. This phenomenon has not been reported hitherto from either of these two genera, and is possibly the first report of light-producing ability to be made on Indian earthworms. There seems to be no correlation between photogenic ability and pigmentation. The luminescence appears in the mucous only after a definite interval has elapsed from the time of ejection of the mucous.

REFERENCE.

Harvey, E. N. 1920. *The Nature of Animal Light.* Monographs on Experimental Biology. Philadelphia.

DESCRIPTION OF A NEW SPECIES OF *HIPPOCAMPUS* FROM THE ANDAMANS.

By GEORG DUNCKER (*Hamburg*).

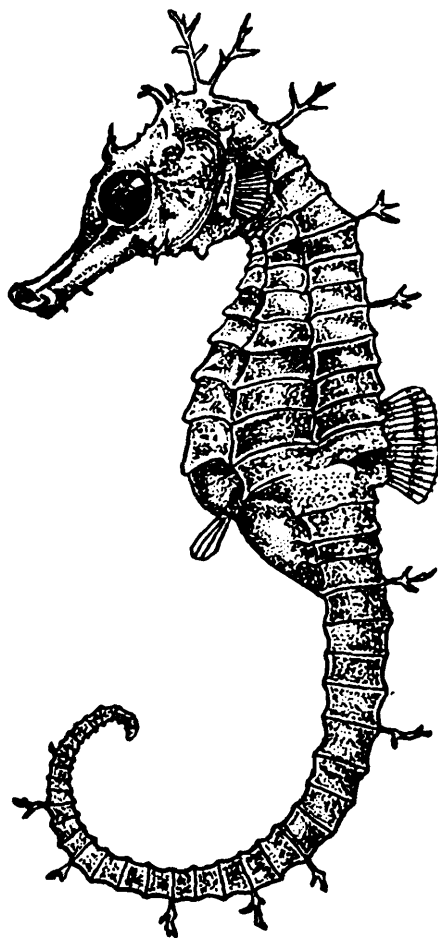
Hippocampus horai, n. sp.

Ann. 11+36, Ann. subd. 2+1, D. 17, A. 4, P. 16, B. i. 7

Rostrum very nearly as long as rest of head-length from the anterior margin of orbit to posterior margin of opercle. Total length 123 mm.

Rings slightly differentiated (subequal). Spines on body-edges little developed, blunt, smooth.

Body densely covered with cutaneous appendices. Those on the supraorbital, frontal, coronal, as well as on the dorsal spines of the 1st, 4th, 7th trunk and the 4th, 8th, 12th, 14th, 17th, 21st and 24th tail rings, and further on the initial (lateral) spine of the upper tail-edge on the 11th trunk-ring are very long and dendritically ramified. Ramified appendices on the 4th and 7th spine of the middle lateral trunk-edge. Dorsal surface of trunk and anterior two-thirds of tail with numerous rather long but not ramified tentacles, becoming fewer and smaller behind; similar but shorter ones on the trunk between middle and lower lateral edges and between the latter and the abdominal edge, especially on the ring-borders. The dorsoventral lips of the pores of the lateral line are prominent, somewhat rough and wart-like papillæ on the trunk, short, smooth, simple tentacles on the tail. Ventral surface of the rostrum with 3 pairs of small somewhat ramified barbels, the anterior pair below the angles of the mouth, the posterior one just in front of the nares. Head, opercles and the entire body strewn with small cutaneous warts.



Hippocampus horai, n. sp.

Unicoloured light brown. Dorsal fin weakly pigmented on basal region, with a dark infra-marginal band.

Near *H. kuda* Bleek., but smaller and distinct by the cutaneous appendices. A single male with empty breeding-pouch, collected in the Andamans by Mr. G. H. Booley (*Ind. Mus.* No. 11836).

[Dr. Georg Duncker has very kindly worked out our entire collection of *Hippocampus* and has found in it the following species :—

1. *Hippocampus trimaculatus* Leach.
2. *Hippocampus hystrix* Kaup.
3. *Hippocampus kuda* Bleek.
4. *Hippocampus horai*, sp. nov.
5. *Hippocampus brachyrhynchus* Dunck.
6. *Hippocampus punctulatus* Guichen.

Regarding the last species Dr. Duncker observes that “There is one *Hippocampus* (7895, ♀), given by Dr. Stoliczka, which looks exactly like the American (Atlantic) *H. punctulatus* Guichen. Since its locality seems to be uncertain, I have ventured to determine as such.” So far as we are aware Dr. Stoliczka made no collections in the Atlantic Ocean though he collected over a wide area of the Indo-Pacific Region. The specimen No. 7895 is entered in our register without any mention of the locality but there is very little doubt that Stoliczka must have obtained it from the Indo-Pacific Region. If Dr. Duncker’s determination of this specimen is correct, it shows that both Günther¹ and Day² were probably right when they grouped both Atlantic and Indian species in the synonymy of *Hippocampus guttulatus*.

Besides the species enumerated above there are 5 specimens which have been sent back to us undetermined. Of these one has been found by Duncker to be badly preserved for identification, while among the remaining specimens he considers there are representatives of two different species. *Sunder Lal Hora.*]

Günther, *Cat. Fish. Brit. Mus.* VIII, p. 202 (1870).

² Day, *Fishes of India*, p. 682, pl. clxxiv, fig. 6 (1878).